

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Exam: Function Reflections (Solution version 9)

1. Let function  $f$  be defined by the polynomial below:

$$f(x) = 6x^4 + 7x^3 - 4x^2 + 8x + 9$$

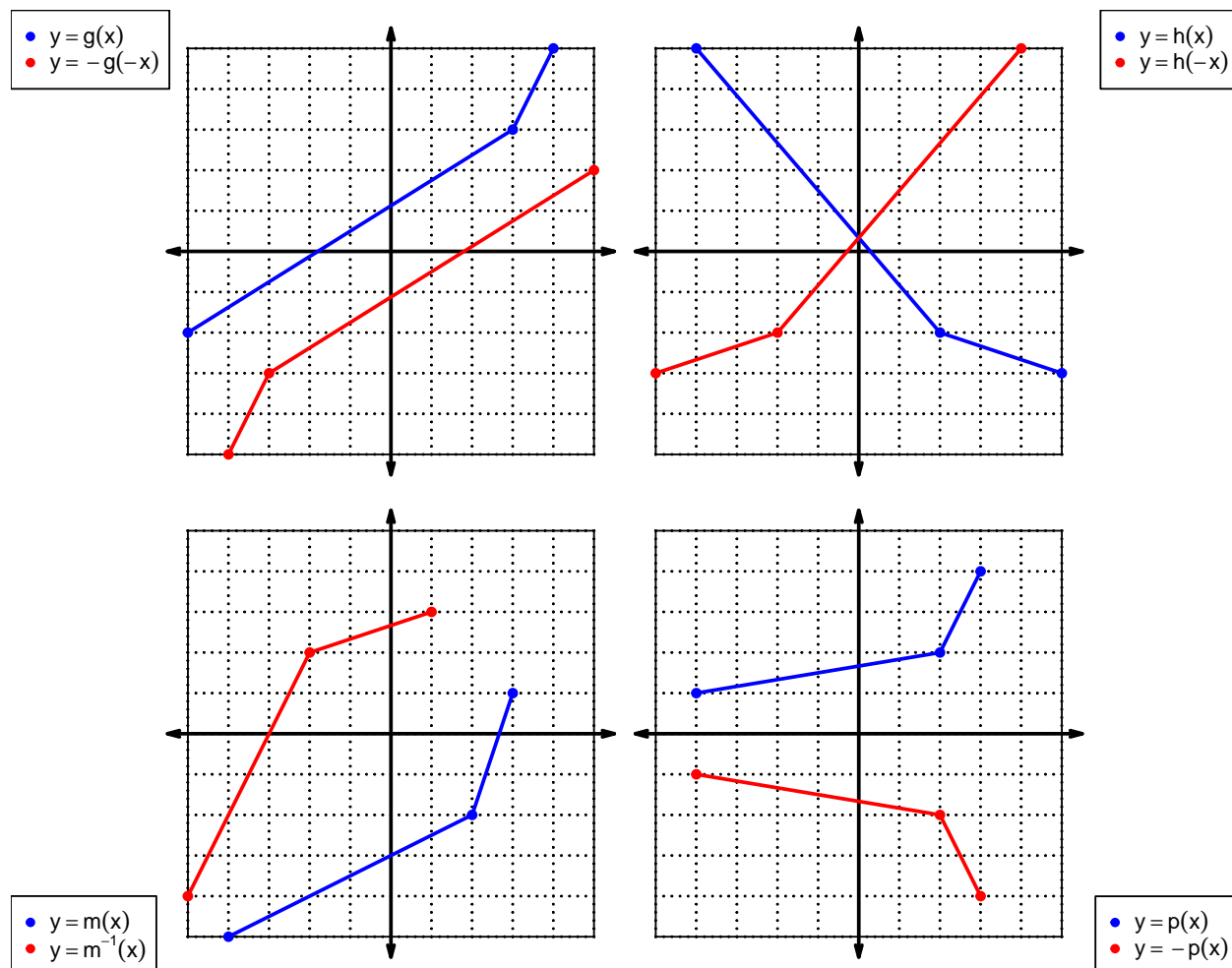
Draw lines that match each function reflection with its polynomial:

Reflections

Polynomials

$f(-x)$	•	•	$-6x^4 - 7x^3 + 4x^2 - 8x - 9$
$-f(x)$	•	•	$-6x^4 + 7x^3 + 4x^2 + 8x - 9$
$-f(-x)$	•	•	$6x^4 - 7x^3 - 4x^2 - 8x + 9$

2. In each  $xy$  plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The  $x$  axis is horizontal and the  $y$  axis is vertical (as typical), and the scale is equal on both axes.



## Exam: Function Reflections (Solution version 9)

For all questions on this page, the functions  $f$ ,  $g$ , and  $h$  are defined by the table below.

$x$	$f(x)$	$g(x)$	$h(x)$
1	2	4	8
2	8	6	7
3	1	9	3
4	9	7	2
5	7	2	6
6	3	1	4
7	6	8	1
8	4	5	9
9	5	3	5

3. Evaluate  $f(6)$ .

$$f(6) = 3$$

4. Evaluate  $h^{-1}(8)$ .

$$h^{-1}(8) = 1$$

5. Assuming  $h$  is an **even** function, evaluate  $h(-7)$ .

If function  $h$  is even, then

$$h(-7) = 1$$

6. Assuming  $g$  is an **odd** function, evaluate  $g(-5)$ .

If function  $g$  is odd, then

$$g(-5) = -2$$

## Exam: Function Reflections (Solution version 9)

7. A function,  $f$ , is **even** if  $f(x) = f(-x)$  for all  $x$  in the domain. A function,  $g$ , is **odd** if  $g(x) = -g(-x)$  for all  $x$  in the domain.

Let polynomial  $p$  be defined with the following equation:

$$p(x) = -x^3 + x$$

- a. Express  $p(-x)$  as a polynomial in standard form.

$$p(-x) = -(-x)^3 + (-x)$$

$$p(-x) = x^3 - x$$

- b. Express  $-p(-x)$  as a polynomial in standard form.

$$-p(-x) = -(x^3 - x)$$

$$-p(-x) = -x^3 + x$$

- c. Is polynomial  $p$  even, odd, or neither?

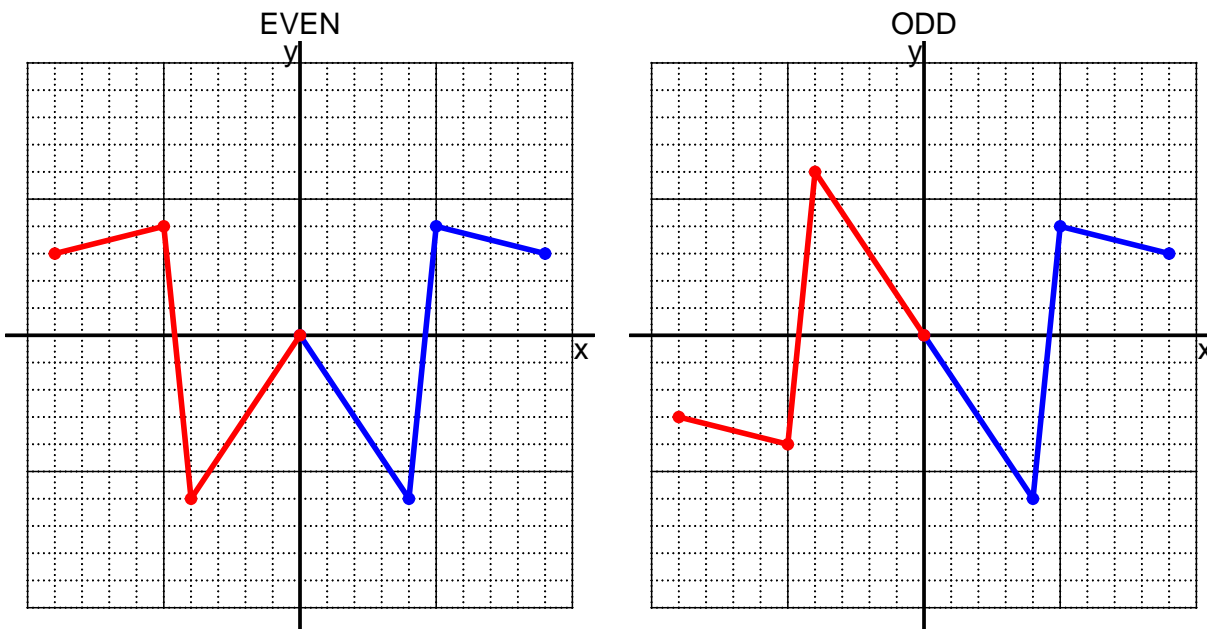
odd

- d. Explain how you know the answer to part c.

We see that  $p(x) = -p(-x)$  for all  $x$  because  $p(x)$  and  $-p(-x)$  are equivalent polynomials. Thus function  $p$  satisfies the criterion for being an odd function.

## Exam: Function Reflections (Solution version 9)

8. I have drawn half of a function. Draw the other half to make it even or odd.



9. Let function  $f$  be defined with the equation below.

$$f(x) = 3x - 7$$

a. Evaluate  $f(24)$ .

step 1: multiply by 3  
step 2: subtract 7

$$f(24) = 3(24) - 7$$

$$f(24) = 65$$

b. Evaluate  $f^{-1}(20)$ .

step 1: add 7  
step 2: divide by 3

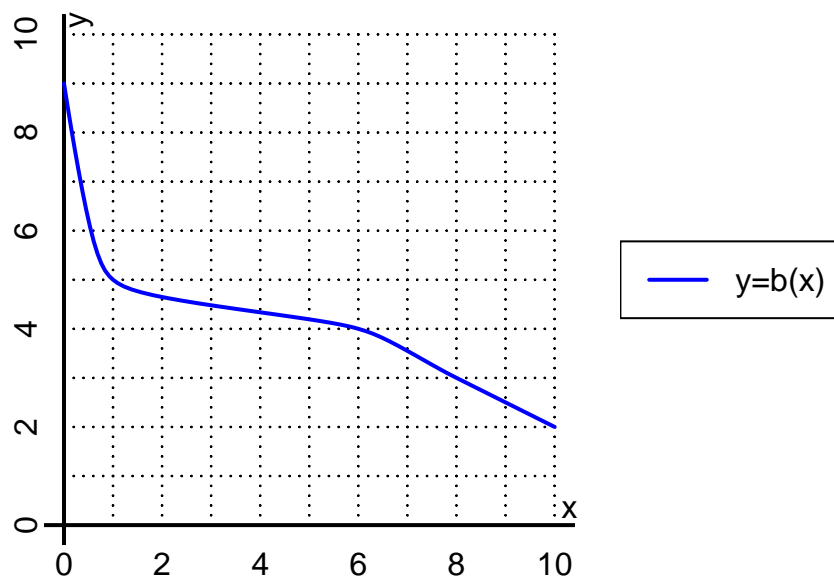
$$f^{-1}(x) = \frac{x + 7}{3}$$

$$f^{-1}(20) = \frac{(20) + 7}{3}$$

$$f^{-1}(20) = 9$$

## Exam: Function Reflections (Solution version 9)

10. The function  $b$  is represented by the curve  $y = b(x)$  graphed below.



a. Evaluate  $b(1)$ .

$$b(1) = 5$$

b. Evaluate  $b^{-1}(4)$ .

$$b^{-1}(4) = 6$$

## Exam: Function Reflections (Solution version 9)

11. Function  $f$  is defined by the table below.

a. Complete the columns for  $-f(x)$  and  $f(-x)$  and  $-f(-x)$ .

$x$	$f(x)$	$-f(x)$	$f(-x)$	$-f(-x)$
-2	4	-4	4	-4
-1	8	-8	-8	8
0	0	0	0	0
1	-8	8	8	-8
2	4	-4	4	-4

b. Is function  $f$  even, odd, or neither?

neither

c. How do you know the answer to part b?

Function  $f$  is neither because neither column  $-f(-x)$  nor column  $f(-x)$  matches column  $f(x)$  exactly.